PATENT ABSTRACTS OF JAPAN

(11)Publication number : 2001-241365

(43)Date of publication of application : 07.09.2001

(51)Int.CI. F02M 27/02
C01B 3/32
C01B 3/38

(21)Application number : 2000-054110

(22)Date of filing : 29.02.2000

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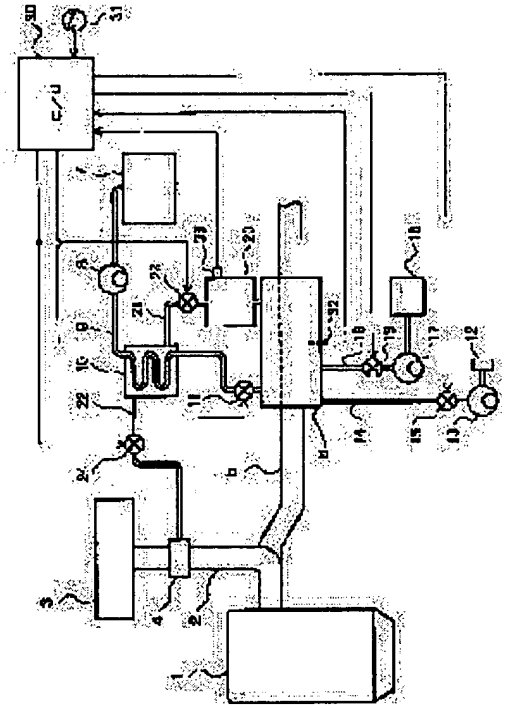
(54) INTERNAL COMBUSTION ENGINE WITH FUEL REFORMING DEVICE

(57)Abstract:

PROBLEM TO BE SOLVED: To provide a fuel reforming device in which fuel, air and water is supplied to a reformer 6 from fuel valve 11, an air valve 15, and a water valve 19, a reformed gas containing mainly hydrogen and carbon monoxide is generated by partial oxidation reaction and vapor reforming reaction, and the reformed gas is supplied through gas valves 23, 24 from a mixer 4 to a suction passage 2 of an engine 1, wherein after stop of an engine, restart of the engine is prepared by storing the reformed gas more than that at the stop of the engine, and lowering of temperature in the reformer 6 is accelerated after stop of the engine.

SOLUTION: When stop of an engine 1 is detected, gas valves 23, 24 and an air valve 15 are closed while a fuel valve 11 and a water valve 19 are kept opened to supply fuel and water to a reformer 6 and to cause vapor reforming reaction i. e., endothermic reaction by remaining heat of the reformer 6. After stop of the engine, the reformed gas produced in the reformer 6 is stored in a reformed gas storage tank 20.



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[Date of request for examination]

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CLAIMS

[Claim(s)]
[Claim 1] An internal combustion engine with a fuel reformer characterized by having a reforming machine which reforms a fuel according to a reforming catalyst with water at least, and establishing a means to supply a fuel and water to a reforming machine in an internal combustion engine with a fuel reformer which supplies reformed gas to an engine when a halt of an engine is detected, and a means to store reformed gas generated with a reforming vessel after a halt of an engine.
[Claim 2] An internal combustion engine with a fuel reformer according to claim 1 which has a means to detect temperature in a reforming machine, and is characterized by increasing the amount of supply of a fuel and water at the time of an engine halt, so that temperature in a reforming machine is high.
[Claim 3] An internal combustion engine with a fuel reformer according to claim 2 which temperature in a reforming machine considers as a property of increasing the amount of supply of a fuel, so that temperature in a reforming machine is high in a field below a predetermined value, and is characterized by not being based on temperature in a reforming machine, but restricting the amount of supply of a fuel to a upper limit in a field in which temperature in a reforming machine exceeds a predetermined value.
[Claim 4] An internal combustion engine with a fuel reformer of any one publication of claim 1 which is equipped with a means to detect a pressure of reformed gas generated with a reforming vessel, and is characterized by decreasing the amount of supply of a fuel and water at the time of an engine halt, so that a pressure of reformed gas is high - claim 3.
[Claim 5] An internal combustion engine with a fuel reformer of any one publication of claim 1 characterized by connecting to said reforming machine an air supply which supplies air required in order to perform a partial oxidation reaction through an air valve, closing said air valve at the time of an engine halt, and suspending supply of air - claim 4.
[Claim 6] An internal combustion engine with a fuel reformer characterized by having a reforming machine which reforms a fuel according to a reforming catalyst, and establishing a means to supply a fuel to a reforming machine in an internal combustion engine with a fuel reformer which supplies reformed gas to an engine when a halt of an engine is detected, and a means to store reformed gas generated with a reforming vessel after a halt of an engine.
[Claim 7] An internal combustion engine with a fuel reformer according to claim 6 which has a means to detect temperature in a reforming machine, and is characterized by increasing the amount of supply of a fuel at the time of an engine halt, so that temperature in a reforming machine is high.
[Claim 8] An internal combustion engine with a fuel reformer according to claim 7 which temperature in a reforming machine considers as a property of increasing the amount of supply of a fuel, so that temperature in a reforming machine is high in a field below a predetermined value, and is characterized by not being based on temperature in a reforming machine, but restricting the amount of supply of a fuel to a upper limit in a field in which temperature in a reforming machine exceeds a predetermined value.
[Claim 9] An internal combustion engine with a fuel reformer of any one publication of claim 6 which is equipped with a means to detect a pressure of reformed gas generated with a reforming vessel, and is characterized by decreasing the amount of supply of a fuel at the time of an engine halt, so that a pressure of reformed gas is high - claim 8.
[Claim 10] An internal combustion engine with a fuel reformer of any one publication of claim 1 characterized by operating an engine with reformed gas stored in said storage means in an engine's predetermined service condition - claim 9.
[Claim 11] Said predetermined service condition is an internal combustion engine with a fuel reformer according to claim 10 characterized by being at the starting time.
[Claim 12] An internal combustion engine with a fuel reformer of any one publication of claim 1 characterized by preparing a reservoir in a supply path of reformed gas from a reforming machine to an engine inhalation-of-air system, and preparing a valve between this reservoir and an engine inhalation-of-air system as said storage means, closing said

valve at the time of an engine halt, and storing reformed gas generated after an engine halt in said reservoir - claim 11. [Claim 13] Said reservoir is an internal combustion engine with a fuel reformer according to claim 12 characterized by being a gas holder.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[The technical field to which invention belongs] This invention has the reforming machine which reforms the alcohol fuel represented by the hydrocarbon fuel represented by the gasoline and the methanol according to a reforming catalyst, and relates to the internal combustion engine with a fuel reformer which supplies to an engine the reformed gas which uses hydrogen and a carbon monoxide as a principal component.
[0002]
[Description of the Prior Art] There are some which are indicated by JP,59-46358,A as a conventional internal combustion engine with a fuel reformer.
[0003] what this leads alcohol fuel to a reforming machine through a fuel path, reforms it in hydrogen content gas with this reforming vessel, and supplies reformed gas to an engine through a gas passageway -- it is -- said gas passageway -- being open for free passage -- hydrogen storage -- public funds -- the hydrogen reservoir room filled up with the group was prepared, and a valve means close the valve at the time of an engine halt to said fuel path and said gas passageway of said hydrogen reservoir room downstream has been established, respectively.
[0004] Therefore, in case it acts as an engine at the time of restart, an engine can be operated using the reformed gas which stored the valve means by the side of said gas passageway in said hydrogen reservoir room by open Lycium chinense.
[0005]
[Problem(s) to be Solved by the Invention] However, the following troubles are **** in order to close the valve means of the fuel path to a reforming machine to a halt of an engine and coincidence in such a conventional internal combustion engine with a fuel reformer.
[0006] (1) There are few amounts of reformed gas which can be stored. Therefore, it cannot operate only with the stored reformed gas until it becomes the temperature which can reform a reforming machine at the time of restart. For this reason, at the time of starting, the necessity of supplying liquid fuel to an engine directly is produced, and systems, such as a fuel-supply system and exhaust air after treatment, become complicated.
[0007] (2) The temperature fall of the reforming machine after a halt of an engine is slow. For this reason, vehicles are suspended, the temperature in the engine room which cannot count upon ventilation rises, and we are anxious about the heat deterioration of an engine room internal.
[0008] This invention aims at bringing forward the temperature fall of the reforming machine after a halt of an engine while it enables it to store much reformed gas by the time of a halt of an engine in view of such a conventional trouble.
[0009]
[Means for Solving the Problem] For this reason, it is characterized by to have a reforming machine which reforms a fuel according to a reforming catalyst with water at least in invention concerning claim 1, and to establish a means to supply a fuel and water to a reforming machine in an internal combustion engine with a fuel reformer which supplies reformed gas to an engine when a halt of an engine is detected, and a means store reformed gas generated with a reforming vessel after a halt of an engine.
[0010] Here, in invention concerning claim 2, it has a means to detect temperature in a reforming machine, and at the time of an engine halt, it is characterized by increasing the amount of supply of a fuel and water, so that temperature in a reforming machine is high. Furthermore, in invention concerning claim 3, temperature in a reforming machine considers as a property of increasing the amount of supply of a fuel, so that temperature in a reforming machine is high in a field below a predetermined value, and in a field in which temperature in a reforming machine exceeds a predetermined value, it is not based on temperature in a reforming machine, but is characterized by restricting the amount of supply of

a fuel to a upper limit.
[0011] Moreover, in invention concerning claim 4, it has a means to detect a pressure of reformed gas generated with a reforming vessel, and at the time of an engine halt, it is characterized by decreasing the amount of supply of a fuel and water, so that a pressure of reformed gas is high.
[0012] Moreover, in invention concerning claim 5, an air supply which supplies air required in order to perform a partial oxidation reaction is connected to said reforming machine through an air valve, and it is characterized by closing said air valve and suspending supply of air at the time of an engine halt.
[0013] What is necessary is on the other hand, to supply only a fuel, since reformed gas is generable with a decomposition reaction which is endothermic reaction in the case of alcohol fuel, if reforming of alcohol fuel is borne in mind.
[0014] For this reason, it is characterized by having a reforming machine which reforms a fuel according to a reforming catalyst in invention concerning claim 6, and establishing a means to supply a fuel to a reforming machine in an internal combustion engine with a fuel reformer which supplies reformed gas to an engine when a halt of an engine is detected, and a means to store reformed gas generated with a reforming vessel after a halt of an engine.
[0015] Here, in invention concerning claim 7, it has a means to detect temperature in a reforming machine, and at the time of an engine halt, it is characterized by increasing the amount of supply of a fuel, so that temperature in a reforming machine is high. Furthermore, in invention concerning claim 8, temperature in a reforming machine considers as a property of increasing the amount of supply of a fuel, so that temperature in a reforming machine is high in a field below a predetermined value, and in a field in which temperature in a reforming machine exceeds a predetermined value, it is not based on temperature in a reforming machine, but is characterized by restricting the amount of supply of a fuel to a upper limit.
[0016] Moreover, in invention concerning claim 9, it has a means to detect a pressure of reformed gas generated with a reforming vessel, and at the time of an engine halt, it is characterized by decreasing the amount of supply of a fuel, so that a pressure of reformed gas is high.
[0017] In invention concerning claim 10, it is characterized by operating an engine with reformed gas stored in said storage means in an engine's predetermined service condition. Furthermore, in invention concerning claim 11, said predetermined service condition is characterized by being at the starting time.
[0018] In invention concerning claim 12, it is characterized by preparing a reservoir in a supply path of reformed gas from a reforming machine to an engine inhalation-of-air system, and preparing a valve between this reservoir and an engine inhalation-of-air system as said storage means, closing said valve at the time of an engine halt, and storing reformed gas generated after an engine halt in said reservoir. Furthermore, in invention concerning claim 13, said reservoir is characterized by being a gas holder.
[0019]
[Effect of the Invention] According to invention concerning claim 1, when a halt of an engine is detected, a fuel and water are supplied to a reforming machine, and the amount of the reformed gas which can be stored can be increased by storing the reformed gas generated with the reforming vessel after the halt of an engine. Therefore, since it can operate only with the stored reformed gas until it reaches the temperature which can reform a reforming machine at the time of restart etc., a system becomes easy. Moreover, in order to make endothermic reaction, such as a steam-reforming reaction, cause by the remaining heat of a reforming machine, the temperature in an engine room rises [the fall of the temperature of a reforming machine] early, and it is ******.
[0020] While according to invention concerning claim 2 being able to increase the amount of generation of reformed gas and being able to increase a quantity to be stored more by increasing the amount of supply of a fuel and water so that the temperature in the reforming machine at the time of an engine halt is high (i.e., so that it has the potential of reforming), the temperature fall of a reforming machine can be brought more forward.
[0021] According to invention concerning claim 3, in the field in which the temperature in the reforming machine at the time of an engine halt exceeds a predetermined value, it is not based on the temperature in a reforming machine, but with restricting the amount of supply of a fuel to a upper limit, while it can prevent that the pressure within a reformed gas storage means rises excessively and the reliability of a fuel-supply system can be improved, the amount of supply of water is increased relatively and a reforming machine can be cooled with the latent heat of water.
[0022] According to invention concerning claim 4, by decreasing the amount of supply of a fuel and water, it can prevent that the pressure within a reformed gas storage means rises excessively, and the reliability of a fuel-supply system can be improved, so that the pressure of the reformed gas at the time of an engine halt is high.
[0023] According to invention concerning claim 5, at the time of an engine halt, it can prevent that the partial oxidation reaction which is exothermic reaction arises, and the temperature fall of a reforming machine can be brought forward by

suspending supply of the air to a reforming machine.
[0024] According to invention concerning claim 6, when reforming of alcohol fuel is borne in mind, when a halt of an engine is detected, a fuel is supplied to a reforming machine, and the amount of the reformed gas which can be stored can be increased by storing the reformed gas generated with the reforming vessel after the halt of an engine. Therefore, since it can operate only with the stored reformed gas until it reaches the temperature which can reform a reforming machine at the time of restart etc., a system becomes easy. Moreover, in order to make endothermic reaction, such as a decomposition reaction, cause by the remaining heat of a reforming machine, the temperature in an engine room rises [the fall of the temperature of a reforming machine] early, and it is ******.
[0025] While according to invention concerning claim 7 being able to increase the amount of generation of reformed gas and being able to increase a quantity to be stored more by increasing the amount of supply of a fuel so that the temperature in the reforming machine at the time of an engine halt is high (i.e., so that it has the potential of reforming), the temperature fall of a reforming machine can be brought more forward.
[0026] According to invention concerning claim 8, in the field in which the temperature in the reforming machine at the time of an engine halt exceeds a predetermined value, it is not based on the temperature in a reforming machine, but with restricting the amount of supply of a fuel to a upper limit, it can prevent that the pressure within a reformed gas storage means rises excessively, and the reliability of a fuel-supply system can be improved.
[0027] According to invention concerning claim 9, by decreasing the amount of supply of a fuel, it can prevent that the pressure within a reformed gas storage means rises excessively, and the reliability of a fuel-supply system can be improved, so that the pressure of the reformed gas at the time of an engine halt is high.
[0028] According to claim 10 and invention which relates to claim 11 further, it can operate certainly by operating an engine with the reformed gas stored in the storage means in an engine's predetermined service condition especially at the time of starting.
[0029] According to invention concerning claim 12, as a storage means, a reservoir is prepared in the supply path of the reformed gas from a reforming machine to an engine inhalation-of-air system, the valve of the outlet side of a reservoir is closed at the time of an engine halt, and it can store certainly by storing reformed gas, and according to invention concerning claim 13, storage that it is enough constituting said reservoir with a gas holder and positive can be performed further.
[0030]
[Embodiment of the Invention] The gestalt of operation of this invention is explained based on a drawing below. It assumes that drawing 1 uses the hydrocarbon fuel which is the system chart of the internal combustion engine with a fuel reformer which shows 1 operation gestalt of this invention, and is represented by the gasoline as a fuel.
[0031] An air cleaner 3 is formed in an upper edge, and the mixer 4 for fuel gas (reformed gas) supply is formed in the inhalation-of-air path 2 of an engine 1 at the downstream. The reforming machine 6 which performs fuel reforming using exhaust air heat is formed in the flueway 5 of an engine 1, and it fills up with the reforming catalyst in this reforming machine 6.
[0032] The liquid fuel in a fuel tank 7 (hydrocarbon fuel represented by the gasoline) is inhaled by the fuel pump 8, and it is fed at the fuel path 9, and this fuel path 9 penetrates the interior of a heat exchanger 10, and is connected to the fuel entrance of the reforming machine 6 through the fuel valve 11 used as a supply means of a fuel.
[0033] The air duct 14 from the air pump 13 which feeds the air inhaled through the air filter 12 again is connected to the reforming machine 6, and while being this air duct 14, the air valve 15 used as a supply means of air is infixed.
[0034] The water path 18 from the water pump 17 which feeds the water inhaled from the water tank 16 again is connected to the reforming machine 6, and while being this water path 18, **** 19 used as a supply means of water is infixed.
[0035] With the reforming vessel 6, evaporate a fuel and water, and make a hydrocarbon fuel and air react according to a reforming catalyst (partial oxidation reaction; refer to following the (1) type), and a hydrocarbon fuel and a steam are made to react according to a reforming catalyst (steam-reforming reaction; refer to following the (2) type), and the reformed gas which uses hydrogen and a carbon monoxide as a principal component is generated.
[0036]
Cm Hn+(m/2) O2 ->(n/2) H2+mCO ... (1)
Cm Hn+mH2 O->(m+n/2) H2+mCO ... (2)
In addition, the partial oxidation reaction of (1) type is exothermic reaction, and the steam-reforming reaction of (2) types is endothermic reaction.
[0037] The reformed gas outlet of the reforming machine 6 is connected to the reformed gas storage tank (gas holder) 20 used as a storage means (reservoir) to store reformed gas. And the outlet side of the reformed gas storage tank 20 is

connected to a heat exchanger 10 by the gas passageway 21, and the gas passageway 22 from a heat exchanger 10 is further connected to said mixer 4. Here, gas valves 23 and 24 are infixed in the gas passageway 21 between the reformed gas storage tank 20 and a heat exchanger 10, and the gas passageway 22 between a heat exchanger 10 and a mixer 4, respectively.

[0038] Said fuel valve 11, an air valve 15, **** 19 and a gas valve 23, and 24 grades It is controlled by the control unit 30. To a control unit 30 an ignition switch 31 and the service condition (an engine speed --) of an engine 1 A signal is inputted from the sensor of the various kinds which are not illustrated which detects a load etc., and also The signal is inputted from the temperature sensor (temperature detection means in a reforming machine) 32 which detects the temperature Tr in the reforming machine 6, and the pressure sensor (reformed gas pressure detection means) 33 which detects the pressure Pr in the reformed gas storage tank 20.

[0039] In here, all the valves 11, 15, 19, 23, and 24 supply a fuel, air, and water to an aperture and the reforming machine 6 fundamentally at the time of steady operation. It sends to a heat exchanger 10 from the reformed gas storage tank 20, said partial oxidation reaction and a steam-reforming reaction generating reformed gas, and storing in the reformed gas storage tank 20 temporarily. By heat exchange with the fuel in front of reforming After carrying out a temperature fall, it is made to operate from a mixer 4 by supplying reformed gas in the inhalation-of-air path 2 of an engine 1.

[0040] Next, the control at the time of an engine shutdown and restart is explained. A means to supply a fuel and water to the reforming machine 6 in this invention when a halt of an engine 1 is detected, A means to store the reformed gas generated with the reforming vessel 6 after the halt of an engine 1 is established. Said supply means It is attained because after an engine shutdown controls a fuel valve 11 and **** 19 by said control unit 30 for predetermined to period-open and to continue, and said storage means is attained by closing the gas valve 23 (and 24) of the outlet side of the reformed gas storage tank 20 at the time of an engine shutdown.

[0041] Control at the time of an engine shutdown is performed by making ON->OFF of an ignition switch 31 into a trigger according to the flow chart of drawing 2 . Step 1 (it is described in drawing as S1.) In it being the same as that of the following, gas valves 23 and 24 and an air valve 15 are closed. Therefore, a fuel valve 11 and **** 19 presuppose that it has opened.

[0042] At step 2, a temperature sensor 32 detects the temperature Tr in the reforming machine 6 at the time of an engine shutdown. At step 3, a pressure sensor 33 detects the pressure Pr in the reformed gas storage tank 20 at the time of an engine shutdown.

[0043] At step 4, the amount Qf0 of basic fuel supply and the basic water amount of supply Qw0 are calculated based on the temperature Tr in a reforming machine at the time of the detected engine shutdown. Specifically, it searches from the table of drawing 3 .

[0044] Here, the basic amount of supply Qf0 and Qw0 of a fuel and water is enlarged that the amount of supply of a fuel and water will be increased, so that the temperature Tr in a reforming machine is high, as shown in the table of drawing 3 . However, about a fuel, in the field in which the temperature Tr in a reforming machine exceeds the predetermined value A, it is not based on the temperature Tr in a reforming machine, but the basic amount of supply Qf0 is fixed to a upper limit so that the amount of supply of a fuel may be restricted.

[0045] At step 5, the amount correction factor Kf of fuel supply and the water amount-of-supply correction factor Kw are calculated based on the reformed gas pressure Pr at the time of the detected engine shutdown (tank internal pressure). Specifically, it searches from the table of drawing 4 .

[0046] Here, correction factors Kf and Kw are made [as shown in the table of drawing 4 ,] small so that the reformed gas pressure (tank internal pressure) Pr is high, and the amount of supply of a fuel and water may be decreased.

[0047] At step 6, the amount Qf of fuel supply and the water amount of supply Qw are calculated by the degree type. The amount Qf of fuel supply is computed by multiplying Qf=Qf0xKfQw=Qw0xKw Qf0 of basic fuel supply, i.e., the amount, by the amount correction factor Kf of fuel supply, and the water amount of supply Qw is computed by multiplying the basic water amount of supply Qw0 by the water amount-of-supply correction factor Kw.

[0048] At step 7, the corresponding fuel and the water of an amount are supplied to the reforming machine 6 from a fuel valve 11 and **** 19 according to said amount Qf of fuel supply, and the water amount of supply Qw. After supply, at step 8, a fuel valve 11 and **** 19 are closed, and the control at the time of an engine shutdown is ended.

[0049] By such control, a fuel and water are supplied to the reforming machine 6, by making the remaining heat of the reforming machine 6 perform a steam-reforming reaction, reformed gas can be generated after an engine shutdown at the time of an engine shutdown, and this can be stored in the reformed gas storage tank 20 at it. Moreover, since a steam-reforming reaction is endothermic reaction, the temperature in the reforming machine 6 can be reduced promptly by this, and the temperature rise in an engine room can be suppressed.

[0050] Moreover, while being able to increase the amount of generation of reformed gas and being able to increase a quantity to be stored more by increasing the amount of supply of a fuel and water so that the temperature Tr in the reforming machine 6 at the time of an engine shutdown is high (i.e., so that it has the potential of reforming), the temperature fall of the reforming machine 6 can be brought more forward.
[0051] However, in the field in which the temperature Tr in the reforming machine 6 exceeds the predetermined value A, it carries out to considering the amount of supply of a fuel as abbreviation regularity, it increasing the amount of supply of water relatively, and making the reforming machine 6 cool with the latent heat of water so that a fuel may be reformed excessively, the tank internal pressure after an engine shutdown may be increased and the reliability of a fuel-supply system may not be reduced. Although only in the case of water water evaporates and tank internal pressure once rises, it is because it condenses after that and a pressure declines.
[0052] Moreover, it can prevent that the pressure Pr after an engine shutdown rises excessively by decreasing the amount of supply of a fuel and water, so that the pressure Pr in the reformed gas storage tank 20 at the time of an engine shutdown is high.
[0053] Moreover, about supply of the air to the reforming machine 6, by closing an air valve 15 promptly and stopping at the time of an engine shutdown, it can prevent that the partial oxidation reaction which is exothermic reaction arises, and the temperature fall of the reforming machine 6 can be brought forward.
[0054] Control at the time of engine restart is performed by making OFF->ON of an ignition switch 31 into a trigger according to the flow chart of drawing 5 . At step 11, gas valves 23 and 24 are opened first and the reformed gas which was being stored in the reformed gas storage tank 20 is supplied to the inhalation-of-air path 2 of an engine 1 from a mixer 4.
[0055] At step 12, it judges whether with the temperature sensor 32, the temperature Tr in the reforming machine 6 was detected, and the temperature Tr in a reforming machine became beyond a predetermined value (temperature which can be reformed) at the following step 13.
[0056] In the case of a Tr< predetermined value, detection and a judgment of Tr of steps 12 and 13 are repeated, and it waits to become a Tr>= predetermined value by the rise of an exhaust-gas temperature. That is, at the time of restart, it operates only with the stored reformed gas until it reaches the temperature which can reform the reforming machine 6.
[0057] And in the phase used as a Tr>= predetermined value, it progresses to step 14, a fuel valve 11, an air valve 15, and **** 19 are opened, fuel reforming in the reforming machine 6 is started, the control at the time of restart is ended, and it usually shifts to control.
[0058] In addition, although the case where the hydrocarbon fuel represented by the gasoline was used as a fuel was explained above, it is performed as follows when using the alcohol fuel represented by the methanol.
[0059] The reforming reaction in the case of a methanol is a decomposition reaction like a degree type, and this is endothermic reaction.
That what is necessary is to supply only a fuel to CH3 OH->2H2+CO, therefore the reforming machine 6 which performs fuel reforming in this case, if only a fuel is supplied to the reforming machine 6 also when a halt of an engine 1 is detected, generation of the reformed gas by the remaining heat of the reforming machine 6 and the prompt temperature fall of the reforming machine 6 by endothermic reaction can be attained. And control of the amount of fuel supply in this case can acquire the same effect by carrying out like control of the amount of fuel supply in the case of gasoline reforming.
[0060] Moreover, as a storage means (reservoir) of reformed gas, a gas holder is used and also an occlusion alloy like a publication may be used for said official report.

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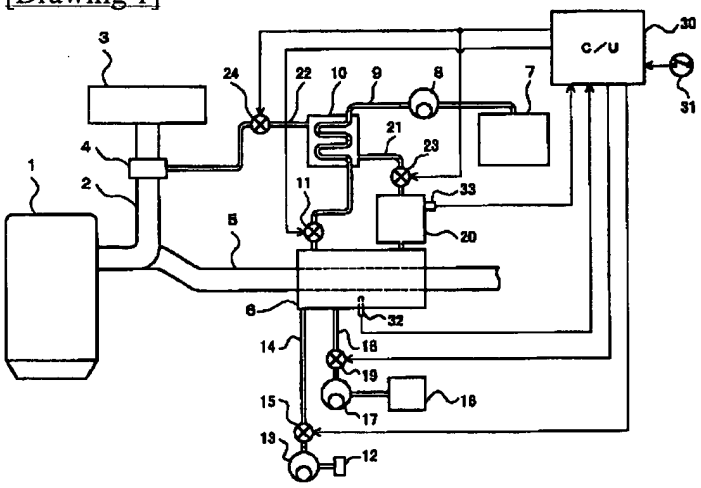
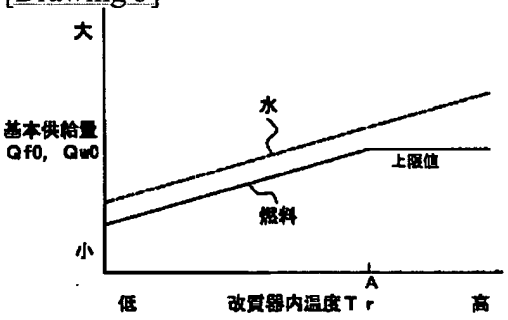
DRAWINGS

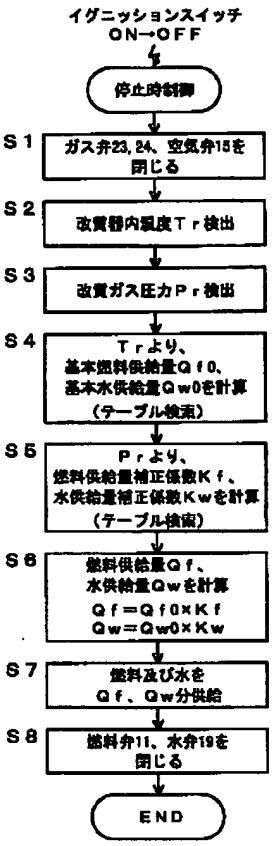
[Drawing 1]



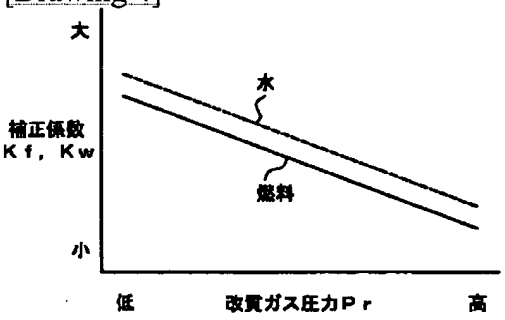
[Drawing 3]



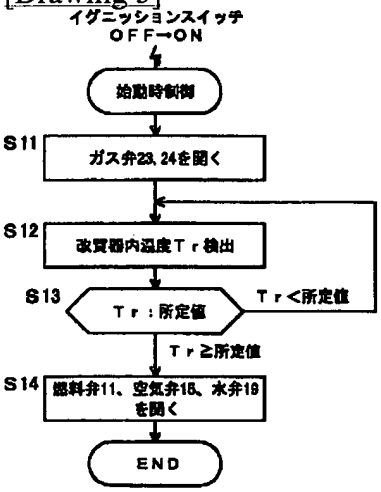
[Drawing 2]



[Drawing 4]



[Drawing 5]



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